## Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application.

These amendments introduce no new matter and support for the amendment is replete throughout the specification and claims as originally filed. These amendments are made without prejudice and are not to be construed as abandonment of the previously claimed subject matter, or agreement with any objection or rejection of record.

## Listing of Claims:

**1-103.** (Cancelled).

**104.** (Original) A photovoltaic device, comprising:

a first electrode layer;

a second electrode layer; and

a first photoactive layer disposed between the first and second electrode layers, wherein the photoactive layer is disposed in at least partial electrical contact with the first electrode and with the second electrode, wherein the photoactive layer comprises a first population of nanostructures and (a) a conductive polymer whose charge carrying properties have been altered by controlled partial oxidation of the polymer and/or (b) a small molecule.

**105.** (Original) The photovoltaic device of claim **104**, wherein the nanostructures and the oxidized conductive polymer of (a) or the small molecule of (b) exhibit a type II band offset energy profile.

**106.** (Original) The photovoltaic device of claim **104**, wherein the small molecule of (b) comprises a semiconductive, organic, nonpolymeric molecule.

**107.** (Original) The photovoltaic device of claim **104**, wherein the small molecule of (b) has a molecular weight less than 3000, less than 2000, less than 1500, less than 1000, or less than 500.

**108.** (Original) The photovoltaic device of claim **104**, wherein the small molecule of (b) conducts holes.

**109.** (Original) The photovoltaic device of claim **104**, wherein the nanostructures are disposed in a matrix comprising the oxidized conductive polymer of (a) or the small molecule of (b).

**110.** (Original) The photovoltaic device of claim **104**, wherein the photoactive layer comprises at least two sublayers, wherein at least one of the sublayers comprises the nanostructures and at least one of the sublayers comprises the oxidized conductive polymer of (a) or the small molecule of (b).

**111.** (Original) The photovoltaic device of claim **104**, wherein the photoactive layer comprises the small molecule of (b) dispersed in a polymer.

**112.** (Original) The photovoltaic device of claim **111**, wherein the polymer is a conductive polymer.

**113.** (Original) The photovoltaic device of claim **104**, wherein the nanostructures comprise nanocrystals.

**114.** (Original) The photovoltaic device of claim **104**, wherein the nanostructures comprise nanowires.

**115.** (Original) The photovoltaic device of claim **104**, wherein the nanostructures comprise: a single-crystal nanostructure, a double-crystal nanostructure, a polycrystalline nanostructure, or an amorphous nanostructure.

**116.** (Original) The photovoltaic device of claim **104**, wherein the nanostructures comprise at least a portion that is comprised of a semiconductor selected from the group consisting of: a Group II-VI semiconductor, a Group III-V semiconductor, a Group IV semiconductor, and an alloy thereof

**117.** (Original) The photovoltaic device of claim **104**, wherein the population of nanostructures comprises nanocrystals that comprise one or more of: CdSe, CdTe, InP, InAs, CdS, ZnS, ZnSe, ZnTe, HgTe, GaN, GaP, GaAs, GaSb, InSb, Si, Ge, AlAs, AlSb, PbSe, PbS, or PbTe.

**118.** (Original) The photovoltaic device of claim **104**, wherein the photoactive layer is disposed in at least partial electrical contact with the first electrode along a first plane and with the second electrode along a second plane.

**119.** (Original) The photovoltaic device of claim **118**, wherein the nanostructures of the first population each has at least one elongated section oriented predominantly normal to at least the first plane.

**120.** (Original) The photovoltaic device of claim **104**, wherein the nanostructures comprise branched nanocrystals having more than one elongated segment.

**121.** (Original) The photovoltaic device of claim **104**, further comprising a hole or electron blocking layer disposed between the photoactive layer and the first or second electrode.

**122.** (Original) The photovoltaic device of claim **104**, further comprising a hole blocking layer disposed between the photoactive layer and the first electrode and an electron blocking layer disposed between the photoactive layer and the second electrode.

**123.** (Original) The photovoltaic device of claim **104**, wherein at least one of the first and second electrodes are flexible.

**124.** (Original) The photovoltaic device of claim **123**, wherein the first and second electrodes and the photoactive layers are flexible.

**125.** (Original) The photovoltaic device of claim **104**, wherein at least one of the first and second electrodes comprises a transparent conductive layer.

**126.** (Original) The photovoltaic device of claim **104**, wherein at least one of the electrodes comprises aluminum.

**127.** (Original) The photovoltaic device of claim **104**, wherein the photoactive layer is hermetically sealed.

**128.** (Original) The photovoltaic device of claim **127**, the device comprising at least one sealing layer in addition to the first and second electrodes.

**129.** (Original) The photovoltaic device of claim **128**, wherein the device comprises at least first and second sealing layers, the photoactive layer and first and second electrodes being sandwiched between the first and second sealing layers.

**130.** (Original) The photovoltaic device of claim **104**, wherein the overall device comprises a non-planar architecture.

**131.** (Original) The photovoltaic device of claim **104**, wherein the device comprises a convex architecture.

**132.** (Original) The photovoltaic device of claim **104**, wherein the first electrode layer, the photoactive layer and the second electrode layer are oriented in a coiled architecture.

**133.** (Original) The photovoltaic device of claim **104**, wherein the first electrode layer, the photoactive layer and the second electrode layer are oriented in a reciprocating stacked architecture.

**134.** (Original) The photovoltaic device of claim **104**, wherein the first population of nanostructures comprises at least two different nanocrystal subpopulations, each nanocrystal subpopulation having a different absorption spectrum.

**135.** (Original) The photovoltaic device of claim **134**, wherein the different nanocrystal subpopulations comprise different compositions.

**136.** (Original) The photovoltaic device of claim **134**, wherein the different nanocrystal subpopulations comprise nanocrystals having different size distributions.

**137.** (Original) The photovoltaic device of claim **104**, wherein the device comprises at least a second photoactive layer.

**138.** (Original) The photovoltaic device of claim **104**, further comprising:

a third electrode layer;

a fourth electrode layer; and,

a second photoactive layer disposed between the third and fourth electrode layers, wherein the second photoactive layer is disposed in at least partial electrical contact with the third electrode along a third plane and in at least partial electrical contact with the fourth electrode along a fourth plane, wherein the second photoactive layer comprises a

second population of nanostructures having a different absorption spectrum from the first population of nanostructures, and wherein the third electrode layer, fourth electrode layer and second photoactive layer are attached to, but electrically insulated from, the first electrode layer, second electrode layer and first photoactive layer.

**139.** (Original) The photovoltaic device of claim **104**, comprising:

a third electrode layer; and,

a second photoactive layer disposed between the second and third electrode layers, wherein the second photoactive layer is disposed in at least partial electrical contact with the second electrode and in at least partial electrical contact with the third electrode.

**140.** (Original) The photovoltaic device of claim **104**, comprising:

a second photoactive layer; and,

a first recombination material disposed between the first and second photoactive layers, wherein the first recombination material is in at least partial electrical contact with the first and second photoactive layers.

**141.** (Original) A photovoltaic device, comprising:

a first electrode layer;

a second electrode layer;

a first recombination material disposed between the first and second electrode layers;

a first photoactive layer disposed between the first electrode layer and the first recombination material, wherein the first photoactive layer is disposed in at least partial electrical contact with the first electrode and with the first recombination material, and wherein the first photoactive layer comprises a first population of nanostructures; and,

a second photoactive layer disposed between the first recombination material and the second electrode layer, wherein the second photoactive layer is disposed in at least partial electrical contact with the second electrode and with the first recombination material, and wherein the second photoactive layer comprises a second population of nanostructures.

**142.** (Original) The photovoltaic device of claim **141**, wherein the first and second photoactive layers each comprises a material that exhibits a type II band offset energy profile.

**143.** (Original) The photovoltaic device of claim **141**, wherein the first recombination material comprises a recombination layer disposed between the first and second photoactive layers.

**144.** (Original) The photovoltaic device of claim **141**, wherein the first photoactive layer is disposed in at least partial electrical contact with the first electrode along a first plane and the second photoactive layer is disposed in at least partial electrical contact with the second electrode along a second plane.

**145.** (Original) The photovoltaic device of claim **144**, wherein the nanostructures of the first population each has at least one elongated section oriented predominantly normal to at least the first plane and/or the nanostructures of the second population each has at least one elongated section oriented predominantly normal to at least the second plane.

**146.** (Original) The photovoltaic device of claim **141**, wherein the first photoactive layer comprises a first population of nanocrystals disposed in a conductive polymer matrix and/or the second photoactive layer comprises a second population of nanocrystals disposed in a conductive polymer matrix.

**147.** (Original) The photovoltaic device of claim **146**, wherein the charge carrying properties of the conductive polymer matrix of the first and/or second photoactive layer have been altered by controlled partial oxidation of the polymer.

**148.** (Original) The photovoltaic device of claim **141**, wherein the first photoactive layer comprises a first population of nanocrystals disposed in a matrix comprising a small molecule and/or the second photoactive layer comprises a second population of nanocrystals disposed in a matrix comprising a small molecule.

**149.** (Original) The photovoltaic device of claim **141**, wherein the first photoactive layer comprises a first inorganic material and a second inorganic material different from the first inorganic material, which first and second inorganic materials exhibit a type II band offset energy profile, and wherein the nanostructures of the first population comprise the first inorganic material, the second inorganic material, or a combination thereof, and/or wherein the second photoactive layer comprises a third inorganic material and a fourth inorganic material different from the third inorganic material, which third and fourth inorganic

materials exhibit a type II band offset energy profile, and wherein the nanostructures of the second population comprise the third inorganic material, the fourth inorganic material, or a combination thereof.

**150.** (Original) The photovoltaic device of claim **141**, wherein the nanostructures of the first and/or second population comprise at least a portion that is comprised of a semiconductor selected from Group II-VI, Group III-V or Group IV semiconductors or alloys thereof.

**151.** (Original) The photovoltaic device of claim **141**, wherein at least one of the first and second electrodes comprises a transparent conductive layer.

**152.** (Original) The photovoltaic device of claim **141**, wherein the first recombination material comprises a transparent material.

**153.** (Original) The photovoltaic device of claim **141**, wherein the first recombination material comprises a metal, a conductive polymer, and/or a small molecule.

**154.** (Original) The photovoltaic device of claim **153**, wherein the first recombination material comprises aluminum, silver, gold, PEDOT:PSS, TPD, NPD, and/or TAZ.

**155.** (Original) A photovoltaic device, comprising:

a first electrode layer;

a second electrode layer;

a third electrode layer;

a first photoactive layer disposed between the first electrode layer and the second electrode layer, wherein the first photoactive layer is disposed in at least partial electrical contact with the first electrode and with the second electrode, wherein the first photoactive layer comprises a first population of nanostructures; and,

a second photoactive layer disposed between the second electrode layer and the third electrode layer, wherein the second photoactive layer is disposed in at least partial electrical contact with the second electrode and with the third electrode, wherein the second photoactive layer comprises a second population of nanostructures.

**156.** (Original) The photovoltaic device of claim **155**, wherein the first and second photoactive layers each comprises a material that exhibits a type II band offset energy profile.

**157.** (Original) The photovoltaic device of claim **155**, wherein the first photoactive layer is disposed in at least partial electrical contact with the first electrode along a first plane and in at least partial electrical contact with the second electrode along a second plane, and wherein the second photoactive layer is disposed in at least partial electrical contact with the second electrode along a third plane and in at least partial electrical contact with the third electrode along a fourth plane.

**158.** (Original) The photovoltaic device of claim **157**, wherein the nanostructures of the first population each has at least one elongated section oriented predominantly normal to at least the first plane and/or the nanostructures of the second population each has at least one elongated section oriented predominantly normal to at least the third plane.

**159.** (Original) The photovoltaic device of claim **155**, wherein the first photoactive layer comprises a first population of nanocrystals disposed in a conductive polymer matrix and/or the second photoactive layer comprises a second population of nanocrystals disposed in a conductive polymer matrix.

**160.** (Original) The photovoltaic device of claim **159**, wherein the charge carrying properties of the conductive polymer matrix of the first and/or second photoactive layer have been altered by controlled partial oxidation of the polymer.

**161.** (Original) The photovoltaic device of claim **155**, wherein the first photoactive layer comprises a first population of nanocrystals disposed in a matrix comprising a small molecule and/or the second photoactive layer comprises a second population of nanocrystals disposed in a matrix comprising a small molecule.

**162.** (Original) The photovoltaic device of claim **155**, wherein the first photoactive layer comprises a first inorganic material and a second inorganic material different from the first inorganic material, which first and second inorganic materials exhibit a type II band offset energy profile, and wherein the nanostructures of the first population comprise the first inorganic material, the second inorganic material, or a combination thereof, and/or wherein

the second photoactive layer comprises a third inorganic material and a fourth inorganic material different from the third inorganic material, which third and fourth inorganic materials exhibit a type II band offset energy profile, and wherein the nanostructures of the second population comprise the third inorganic material, the fourth inorganic material, or a combination thereof.

**163.** (Original) The photovoltaic device of claim **155**, wherein the nanostructures of the first and/or second population comprise at least a portion that is comprised of a semiconductor selected from Group II-VI, Group III-V or Group IV semiconductors or alloys thereof.

**164.** (Original) The photovoltaic device of claim **155**, wherein at least two of the first, second, and third electrodes comprise a transparent conductive layer.

**165-182.** (Cancelled).

**183.** (Original) A composition, comprising: a first population of nanostructures disposed in a matrix, the matrix comprising (a) a first, conductive polymer whose charge carrying properties have been altered by controlled partial oxidation of the polymer and/or (b) a second polymer and a small molecule.

**184.** (Original) The composition of claim **183**, wherein the small molecule of (b) comprises a semiconductive, organic, nonpolymeric molecule.

**185.** (Original) The composition of claim **183**, wherein the small molecule of (b) has a molecular weight less than 3000, less than 2000, less than 1500, less than 1000, or less than 500.

**186.** (Original) The composition of claim **183**, wherein the second polymer of (b) is a conductive polymer.

**187.** (Original) The composition of claim **183**, wherein the nanostructures comprise nanocrystals.

**188.** (Original) The composition of claim **183**, wherein the nanostructures comprise nanowires.

**189.** (Original) The composition of claim **183**, wherein the nanostructures comprise: a single-crystal nanostructure, a double-crystal nanostructure, a polycrystalline nanostructure, or an amorphous nanostructure.

**190.** (Original) The composition of claim **183**, wherein the nanostructures and the matrix exhibit a type II band offset energy profile.

**191.** (Original) The composition of claim **183**, wherein the nanostructures and the matrix exhibit a type I band offset energy profile.

**192.** (Original) A film formed from the composition of claim **183**.

**193.** (Original) The film of claim **192**, wherein the film is disposed between two electrode layers.

**194.** (Original) A composition, comprising: a first population of nanostructures and a small molecule, each nanostructure of the first population having at least one elongated section oriented predominantly normal to at least a first plane.

**195.** (Original) The composition of claim **194**, wherein the nanostructures comprise branched nanocrystals having more than one elongated segment.

**196.** (Original) The composition of claim **194**, wherein the small molecule comprises a semiconductive, organic, nonpolymeric molecule.

**197.** (Original) The composition of claim **194**, wherein the small molecule has a molecular weight less than 3000, less than 2000, less than 1500, less than 1000, or less than 500.

**198.** (Original) The composition of claim **194**, wherein the nanostructures are disposed in a matrix comprising the small molecule.

**199.** (Original) The composition of claim **198**, wherein the matrix comprises a polymer.

**200.** (Original) The composition of claim **199**, wherein the polymer is a conductive polymer.

**201.** (Original) A film formed from the composition of claim **194**, wherein the first plane is parallel to a surface of the film.

**202.** (Original) A composition, comprising:

a population of nanostructures;

a polymer and/or a small molecule;

a first solvent; and,

a second solvent, wherein the first solvent has a vapor pressure that is not equal to a vapor pressure of the second solvent, and wherein at least one of the first and second solvents is free of chloroform and pyridine.

**203.** (Original) The composition of claim **202**, wherein the nanostructures comprise nanocrystals.

**204.** (Original) The composition of claim **202**, wherein the nanostructures comprise: a single-crystal nanostructure, a double-crystal nanostructure, a polycrystalline nanostructure, or an amorphous nanostructure.

**205.** (Original) The composition of claim **202**, wherein the first solvent and the second solvent have different polarities.

**206.** (Original) The composition of claim **202**, wherein the first solvent and/or the second solvent is selected from the group consisting of: chloroform, toluene, tetrahydrofuran, xylene, and chlorobenzene.

**207.** (Original) The composition of claim **206**, wherein the first solvent is toluene and the second solvent is chloroform.

**208.** (Original) The composition of claim **202**, wherein a ratio of the first solvent to the second solvent is greater than 0.15:0.85 and less than 0.85:0.15 by volume.

**209.** (Original) The composition of claim **208**, wherein a ratio of the first solvent to the second solvent is greater than 0.3:0.7 and less than 0.7:0.3 by volume.

**210.** (Original) The composition of claim **202**, comprising a third solvent.

**211-240.** (Cancelled).

**241.** (Original) A method of producing a photovoltaic device, the method comprising:

providing a first planar substrate having a first conductive layer disposed thereon;

coating the first substrate with a composition that comprises a first population of nanostructures to provide a first photoactive layer;

layering a second conductive layer onto the first photoactive layer;

coating the second conductive layer with a composition that comprises a second population of nanostructures to provide a second photoactive layer; and,

layering a third conductive layer onto the second photoactive layer.

**242.** (Original) A method of producing a photovoltaic device, the method comprising:

providing a first planar substrate having a first conductive layer disposed thereon;

coating the first substrate with a composition that comprises a first population of nanostructures to provide a first photoactive layer;

disposing a first recombination material onto the first photoactive layer;

coating the first recombination material and any exposed portion of the first photoactive layer with a composition that comprises a second population of nanostructures to provide a second photoactive layer; and,

layering a second conductive layer onto the second photoactive layer.

**243.** (Original) The method of claim **242**, wherein disposing the first recombination material onto the first photoactive layer comprises coating the first photoactive layer with the first recombination material to provide a first recombination layer.

**244.** (Original) A method of forming a nanocomposite layer, the method comprising:

providing a planar substrate;

providing a first mixture comprising a population of nanostructures, a polymer and/or a small molecule, a first solvent, and a second solvent, wherein the first solvent has a vapor pressure that is not equal to a vapor pressure of the second solvent, and wherein at least one of the first and second solvents is free of chloroform and pyridine; and,

coating the substrate with the first mixture to provide the nanocomposite layer.

**245.** (Original) The method of claim **244**, wherein coating the substrate comprises permitting the evaporation of at least the majority of the first and second solvents.

**246.** (Original) The method of claim **244**, comprising:

providing the nanostructures in the first solvent;

providing the polymer and/or the small molecule in the second solvent; and,

combining the nanostructures in the first solvent and the polymer and/or small molecule in the second solvent to provide the first mixture.

**247.** (Original) The method of claim **246**, wherein the vapor pressure of the first solvent is lower than the vapor pressure of the second solvent.

**248.** (Original) The method of claim **246**, wherein the vapor pressure of the first solvent is higher than the vapor pressure of the second solvent.

**249.** (Original) The method of claim **246**, wherein the first solvent is less polar than the second solvent.

**250.** (Original) The method of claim **246**, wherein the first solvent and the second solvent are combined in a ratio that results in the nanocomposite layer having a selected morphology.

**251.** (Original) The method of claim **244**, wherein a ratio of the first solvent to the second solvent is greater than 0.15:0.85 and less than 0.85:0.15 by volume.

**252.** (Original) The method of claim **251**, wherein a ratio of the first solvent to the second solvent is greater than 0.3:0.7 and less than 0.7:0.3 by volume.

**253.** (Original) The method of claim **244**, wherein coating the substrate with the first mixture comprises spin coating the first mixture onto the substrate.

**254.** (Original) The method of claim **244**, wherein coating the substrate with the first mixture comprises applying the first mixture to the substrate with a doctor-blade or screen printing, ink-jet printing, dip coating, sheer coating, tape casting, or film casting the first mixture onto the substrate.

**255.** (Original) The method of claim **244**, wherein the nanostructures comprise nanocrystals.

**256.** (Original) The method of claim **244**, wherein the nanostructures comprise: a single-crystal nanostructure, a double-crystal nanostructure, a polycrystalline nanostructure, or an amorphous nanostructure.

**257.** (Original) The method of claim **244**, wherein the first solvent and/or the second solvent is selected from the group consisting of: chloroform, toluene, tetrahydrofuran, xylene, and chlorobenzene.

**258.** (Original) The method of claim **257**, wherein the first solvent is toluene and the second solvent is chloroform.

**259.** (Original) The method of claim **244**, wherein the first mixture comprises a third solvent.

**260-283.** (Cancelled).

**284.** (Original) A system for fabricating a nanocomposite layer, comprising:

a source of a composition comprising a population of nanostructures, a polymer and/or a small molecule, a first solvent, and a second solvent, wherein the first solvent has a vapor pressure that is not equal to a vapor pressure of the second solvent, and wherein at least one of the first and second solvents is free of chloroform and pyridine; and,

a layer deposition system fluidly coupled to the source of the composition, the layer deposition system being configured to deposit the composition on a substrate to provide the nanocomposite layer.

**285.** (Original) The system of claim **284**, wherein the layer deposition system is selected from a doctor-blade, a screen printing system, an ink-jet printing system, a dip coating system, a sheer coating system, a tape casting system, and a film casting system.

## REMARKS/ARGUMENTS

### The Status of the Claims.

Claims 104-164, 183-210, 241-259 and 284-285 are pending with entry of this amendment, claims 1-103, 165-182, 211-240 and 260-283 being cancelled This amendment is made without prejudice and is not to be construed as abandonment of the previously claimed subject matter.

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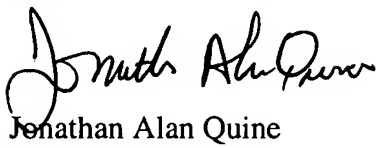
Respectfully submitted,



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